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ABSTRACT

In 1978, the National Science Foundation awarded the University of Wisconsin-Oshkosh $50,000 to determine the continuing education needs of technically-trained persons employed in small, geographically dispersed industries. Thirty companies which employed fewer than 500 people and which were likely to employ scientists, engineers, and technicians were randomly selected from 1,255 firms located in non-urban areas in central and northern Wisconsin. Investigative instruments included a semi-structured interview, president's questionnaire, company continuing education policy questionnaire, and a technical employee's questionnaire. Preliminary results indicate: (1) most small companies record an employee's participation in continuing education but few give formal rewards for participation; (2) workshops, seminars, and conferences are the most likely types of continuing education to be fully financed by companies, while college credit and non-credit courses are primarily partially funded; (3) companies are reluctant to give employees released time for continuing education; (4) the most effective type of continuing education is that conducted in workshops, seminars, and conferences, while correspondence courses are least effective; and (5) presidents of corporations and employees indicate continuing education is important in improving job performance but not in personal development. (RC)

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ASSESSING CONTINUING EDUCATION NEEDS IN SMALL GEOGRAPHICALLY DISPERSED INDUSTRIES

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Abstract

The National Science Foundation awarded the University of Wisconsin-Oshkosh $50,000 to determine the continuing education needs of technically trained persons employed in small, geographically dispersed industries. Thirty companies which employed fewer than 500 people and which were likely to employ scientists, engineers and technicians were randomly selected from 1255 firms located in non-urban areas in central and northern Wisconsin.

A project director and three industrial psychology graduate students conducted the survey. The investigative instruments used included a semi-structured interview, president's questionnaire, company continuing education policy questionnaire and a technical employee's questionnaire. The preliminary results indicate:

1. Most small companies record an employee's participation in continuing education in his/her personnel file but few companies give formal rewards for participation.

2. Workshops, seminars and conferences are the most likely types of continuing education to be fully financed by companies. College credit and non-credit courses are primarily partially funded.

3. Companies are reluctant to give employees released time for continuing education participation.

4. The most effective type of continuing education is that which is conducted in workshops, seminars and conferences. The least effective are correspondence courses.

5. Presidents of corporations and employees indicate continuing education is very important in improving one's performance on the job. Of least importance is personal development.

ASSESSING CONTINUING EDUCATION NEEDS IN SMALL GEOGRAPHICALLY DISPERSED INDUSTRIES

Introduction

Systems of education in the United States were created in times of relatively little technological change; therefore, a person could be taught everything at one time between the ages of 18 and 22 or later if graduate school were involved. Today, rapid technological change requires constant upgrading of knowledge and skills, yet most post-secondary institutions are still groping with providing programs to meet the needs of part-time learners. In large urban areas, it has been feasible to establish continuing education programs because of the extensive population base.

Within the state of Wisconsin the largest industrial populations are located in the southern quarter of the state. Of the approximately 5400 manufacturing industries, over 75 percent are located in the southern quarter of the state. Continuing scientific and engineering education opportunities are comprehensive and readily accessible in this region, e.g., the University of Wisconsin has major campuses at Milwaukee, Madison, Kenosha and Platteville. Also UW-Extension has its principal sites in Madison and Milwaukee and offers engineering and applied sciences programs to over 17,000 people a year. Of the Wisconsin residents participating in these programs, about 65 percent reside in the southern quarter of the state. Evening courses and media programming can be arranged at other locations but these are conditioned upon an interest group initiating a request for a specific course and the availability of faculty, educational materials and equipment.

In addition to degree programs offered by the University of Wisconsin System's 13 four-year universities, 14 UW Center two-year institutions offer associate degree programs in the sciences. These have been helpful to employed technicians, but the programs usually do not provide the specificity and depth of content desired by degreed scientists and engineers. The 18 Wisconsin Vocational, Technical, and Adult Education (VTAE) institutes and colleges also offer technical programs, however, courses cannot be transferred to a university's degree program. Finally, the 21 Wisconsin independent colleges and universities which offer Bachelor's and higher degrees in the sciences and engineering are located principally in Milwaukee or other high industrial population areas outside this study's purview.

Scientists and engineering professional and trade associations which have chapters in Wisconsin regularly have seminars and workshops in technical topics. These programs are not credit bearing and therefore, only meet the needs of non-degree seeking students. Similarly, industrial in-service programs offered by plant personnel or consultants do meet some employee's specific educational needs but they tend to be short, one-time-only offerings.

Problem Statement

In fiscal 1978, the National Science Foundation became specifically concerned about the availability of continuing education for scientists, engineers, and technicians employed in small geographically dispersed industries. Technically trained persons, regardless of employment location, need to be continually up-dated in order to keep current with rapidly changing technologies. Without identifying these needs, no constructive program development or delivery of programs can be accomplished.

This problem can be broken down into several specific questions:

1. What existing continuing education opportunities are available to employed scientists, engineers and technicians?
2. What agencies, institutions, industries and professional associations provide technical continuing education, credit and non-credit, courses?
3. What type of instructional systems are presently being used by industry to deliver technical continuing education programs?
4. How accessible are continuing education opportunities to employed scientists, engineers and technicians? Where are continuing education activities conducted, i.e., on campus, at industry site, in local school building, etc.?
5. What unmet technical continuing education areas or specific subjects should be offered?
6. What incentive systems (e.g., promotion, released time, etc.) are in use by industries to motivate technical employees to pursue continuing education?
7. What educational materials, facilities and equipment are used by industry to support continuing education programs?

The Study

Before considering research methodology, certain parameters and definitions of terms need to be clarified at the outset.

Study Parameters and Definition of Terms

Thirty (30) small geographically dispersed industries in central and northern Wisconsin which employed scientists, engineers and technicians were

selected. The reason for restricting the sample to 30 industries was to allow the investigators to perform an in-depth study of technical persons' continuing education needs.

Industrial Corporation: Any company listed in the Classified Directory of Wisconsin Maufacturers, 1978, located in central or northern Wisconsin, had a Standard Industrial Classification number and had fewer than 500 employees qualified for the study.

Professional and Trade Associations: Any organization which had technical and/or scientists and/or engineers as members and which had regular meetings in central or northern Wisconsin should be studied.

Post-secondary Institutions: Public and independent institutions offering technical, scientific or engineering programs in central and northern Wisconsin should be studied.

Scientists and Engineers: Employees who hold at least a Bachelor's degree (or the equivalent, e.g., P.E.) in an engineering or scientific field and/or spend more than half their time in a scientist or engineering job function should be included.

Technologists: Employees who spend half their time in a scientist or engineering job function and hold at least a Bachelor's degree in a technical field but who do not hold an engineering or scientific degree should be included.

Technicians: Employees who normally hold an Associate degree in engineering or scientific field and/or spend more than half their time in a scientist or engineering job function should be included.

Continuing Education: Education or training which increased the individual's technical competence or education which aided the person's overall

abilities, e.g., management, supervisory skills and personal development should be included. Types of education accepted should be credit and non-credit courses, seminars, workshops and conferences and organized self-study, programmed texts and correspondence courses.

Research Methodology

After the parameters and definition of terms were clarified and delineated, the study consisted of nine phases.

Phase #1: Selecting Participating Industries

The Classified Directory of Wisconsin Manufacturers was used as the basic resource book because it listed over 5400 Wisconsin companies which employed more than 94 percent of the state's industrial workers. The Directory lists industries by the Standard Industrial Classification numbering system which was developed to classify all firms by type of activity to facilitate uniform data analysis.

A committee of local scientists and engineers indentified the SIC categories which most likely would have companies employing technical personnel. These were further verified by Dr. Jerold Levy, Battelle Columbus Laboratories, who has conducted numerous scientists and engineering surveys on a national scale. See SIC code in Table 1.

(Insert Table 1 about here)

About 1255 companies met the criteria of being located in central or northern Wisconsin, having appropriate SIC codes, and employing less than 500 people. Fifty companies were part of the original sample because previous Battelle Columbus Laboratory studies have found only 60 percent of the firms originally asked to participate in a study actually agreed to participate.

Since over 80 percent of the industrial population in the study consisted of very small companies employing less than 100 people, the sample was stra-

tified so larger companies would have adequate representation. Therefore, the sample consisted of 50 percent very small firms (1-100 employees) and 50 percent small to medium size firms (101 to 500 employees). SIC codes of selected companies were fairly representative of the industrial population. Also the geographical distribution of selected companies was similar to all qualifying industries.

Phase #2: Soliciting Company Participation

To develop interest and seek their willingness to participate in a study, an introductory letter was mailed to the president or chairman of the board of each company by the University's Chancellor. Names of chief corporation officers were obtained from the Classified Directory of Wisconsin Manufacturers. The Chancellor's letter stated the director of the grant would personally be contacting them within ten days of receipt of letter. A second follow-up letter was sent within a few days from the project director to the same addressees explaining in detail the intent of the study and what would be the time commitment on the part of company personnel.

Within the specified ten-day period, the project director phoned each corporation officer requesting his support and commitment of the company to participate. The response was very reassuring, with 32 companies stating they were willing to participate. The 18 firms which did not agree to participate gave one or more of the following reasons:

(a) no time available to participate; too busy

(b) no technical people were employed, only semi-skilled or unskilled laborers do the work

(c) consultants or parent company technical employees frequently visited the plant therefore, no need to employ resident technical personnel

(d) all research, development, design and technical expertise necessary to produce a product are accomplished at another site, therefore, no need to employ resident technical personnel

(e) plant is strictly a "job shop" with no technical people employed

(f) all training is on-the-job training conducted in-plant so there is no need for continuing education by outsiders.

After the 32 companies agreed to participate, a thank you letter was sent confirming their interest and stating that an orientation conference to the project would be scheduled within a month.

Phase #3: Interview Training Workshop

The graduate students majoring in industrial psychology were interviewed for three graduate assistantships supported by the grant. The main criterion for selection was their experience and interest in conducting on-site interviews with corporation executives. After the three students were employed, it was soon determined that all were in need of a rigorous workshop on interview techniques as they apply to business corporations.

A series of four workshops was designed by the University's Director of Career Planning and Placement. Each hour and a half session included the following topics.

First Interview Workshop: Orientation, expectations of interviewing and discussion of designing an interview instrument.

Second Interview Workshop: Working with grant "Problem Statement", the students and instructor designed a draft interview instrument.

Third Interview Workshop: Reviewed and critiqued the interview instrument draft for clarity and logical flow of statements. Also tested to determine if items could be realistically covered in a 20 to 30 minute interview session.

Fourth Interview Workshop: Each student role-played with another student to critique if questions were asked appropriately and the respondent was able to answer questions within the proper time period.

Phase #4: Designing Instruments

Following the interview workshops, the project director and graduate students were better able to determine the most appropriate instruments for meeting each grant "Problem Statement". Some of the questions could be better evaluated through an interview, i.e., soliciting opinions, philosophies, perspectives, when others could be better assessed through an objective questionnaire(s) which would require study and research before responding.

The matrix in Table 2 was designed after each "Problem Statement" was thoroughly discussed and analyzed and the most efficient and effective means of obtaining the information were agreed upon. Also each instrument was pilot tested in three local industries to improve the clarity and meaning of each statement.

(Insert Table 2 about here)

An explanation of each instrument's purpose and content are discussed here.

The Company Interview Instrument. The purpose was to obtain personal views about continuing education from four to five corporation officers and chief engineers. The open-ended instrument included: in-plant programs, importance of continuing education to company, how well continuing education is meeting company needs, how accessible continuing education is to employees, what incentives motivate employees, problems with continuing education delivery,

and the types of education activities employees have participated in and would like to participate in the future.

The Presidents' Questionnaire. This instrument was designed to determine from the chief company executive the management's interest and support of continuing education. Items included company background characteristics, types of technology the company was engaged in, and decision-making processes used.

The Company Policy Questionnaire. The intent of this instrument was to record each company's continuing education policy. Questions requested specific dollar amounts the company allocated for continuing education, level of reimbursement, type of continuing education supported, i.e., credit, non-credit, workshops, self-study, and type and dollar amount of education equipment and education materials.

The Technical Person Questionnaire. Except for the company president, all persons interviewed and all technical persons holding managerial or first-line supervisory positions were requested to complete this instrument. This questionnaire's purpose was to determine in detail, credit and non-credit courses, seminars, and self-study activities these people have participated in during the past three years and would like to participate in the next three years. Items also asked respondents to provide personal background information and to evaluate existing continuing education programs.

The Professional and Trade Association Interview and Questionnaire Instruments. About 45 professional and trade associations in the scientific and engineering fields were contacted to provide information about continuing education. There are many programs offered by these groups and these instruments solicited information on what has been offered in the past three years and what programs are planned in the future.

Phase #5: Company Orientation Conferences

In order to fully explain the project to the 32 participating companies, five orientation conferences were held at locations near the firms. The project director and three graduate students met corporation presidents or their surrogates at each location for about two hours each. The sites were Oshkosh, Green Bay, Sheboygan, Menomonie, and Wausau.

The response was excellent with 28 of the 32 corporations sending representatives. Those companies unable to attend a meeting were sent materials about the forthcoming on-site interviews and follow-up phone calls were made to assure they understood the project.

Phase #6: On-Site Plant Interviews

Over a period of two months, the three graduate students visited each industrial plant. Some companies had five persons interviewed while others had two. Also the number of technical questionnaires completed by company personnel varied from 25 to two. In all cases, the company policy and president's questionnaires were completed.

Two companies, however, after several contacts, decided not to participate further in the study. Their reason for dropping out was lack of time for interviews.

Phase #7: Professional Association Interviews

Of the 45 associations contacted, 23 presidents or chairpersons were interviewed over the phone and 17 were mailed questionnaires because phone contact was not possible. Five associations did not have either a phone or a state address, so they were dropped from the study.

Phase #8: Post-Secondary Educational Institutions' Technical Programs

As stated earlier in the report, central and northern areas of Wisconsin higher education institutions are not offering extensive continuing education

programs for employed scientists, engineers and technicians. After reviewing the catalogs of VTAE institutions, UW Centers, UW campuses, and two and four-year independent colleges and universities in the study area, this fact was confirmed. Degrees and some courses are available to technical personnel but normally these are only offered in a traditional format during the day.

Phase #9: Data Analysis and Synthesis

Data collected from questionnaires and interviews are being coded and loaded on computer tape. Demographics and continuing education items are still being analyzed as of this date. Some general study observations from preliminary results are stated below.

Observations

The data are preliminary findings of the study. They are general because interrelationships and cross tabulations analyses are still being performed These observations are based on 30 companies and 187 technical employees.

Population Demographics

More scientists, engineers, and technicians held the Bachelor's degree (37%) than any other degree. However, about a third (30%) had only a high school diploma. As suspected, small companies have many non-degree persons filling technical positions.

The respondents were either supervisors of technicians, supervisors or managers of scientists and engineers. These data simply indicate that the intended sample group was indeed the people who actually participated in the study.

The applied science and engineering field the respondents were primarily engaged in were: mechanical (21%), industrial (18%), design (14%), electrical (10%), process (8%), research and development (8%), chemical (7%) and paper pulp (4%). These fields appear to reflect the SIC codes and therefore are a representative study group.

Company Continuing Education Policy

One corporation officer from each of the 30 companies completed a questionnaire on continuing education policy.

Most (17) of the 30 companies recognize participation in continuing education by recording the course in the employee's personnel file. A few (3 to 7) companies rewarded their employees with: released time, a certificate of completion, promotion and/or pay raise. No company gave their employees a bonus for participating in continuing education.

Over two-thirds of the companies reimbursed their employees with at least partial payment for tuition, fees and books.

All but one company provided full reimbursement of tuition and fees for workshops, seminars and conferences. About half the companies paid all tuition and fees for non-credit courses and only a third paid full tuition and fees for credit courses and organized self-study activities.

Very few companies (about 5) allowed employees released time from work to pursue continuing education. Most (60%) did not let employees make up hours missed during the regular work day.

Effectiveness and Importance of Continuing Education

Each company president and a sample of each firm's technical employees evaluated their continuing education experiences and preferences.

The most effective type of continuing education was in-service training. Both presidents and employees rated this very effective. Also workshops,

seminars and conferences were strongly supported by presidents and employees.

The least effective continuing education, according to both the presidents and employees, were correspondence courses. Also only a third of both groups rated college credit and non-credit courses moderately to very effective.

Only self-study activities were evaluated significantly different by presidents and employees. About half the presidents believed self-study was very effective while over 80 percent of the employees thought it was.

Both presidents (63%) and employees (62%) indicated continuing education was very important to performing their jobs better. Company presidents, however, rated continuing education's beneficial effect on the employee's salary, promotion and responsibilities higher than did the employees. Fifty-eight percent of the presidents said continuing education was a very important influence on these factors while only 40 percent of the employees gave these factors such a rating.

Continuing education's contribution to "personal development" was not an important factor. Only 25 percent of the employees and 38 percent of the presidents said continuing education was very important in this dimension.

Table 1

Selected SIC Codes

20's	Food and Kindred Products
24's	Lumber and Wood Products
26's	Printing and Publishing
28's	Chemicals and Allied Products
29's	Petroleum and Coal Products
30's	Rubber and Miscellaneous Plastics Products
32's	Stone, Clay and Glass Products
33's	Primary Metal Industries
34's	Fabricated Metal Products
35's	Machinery, except Electrical
36's	Electric and Electronic Equipment
37's	Transportation Equipment
38's	Instruments and Related Products
48's	Communication
73's	Business Services
89's	Miscellaneous Services (consulting firms)

Table 2

Problem Statements and Instruments Matrix

Number of Questions

Problem Statements	Types of Instruments				
	Company Interview	Presidents Quest.	Technical Quest.	Company Policy Quest.	Prof. Assoc. Interview
Continuing education availablity	4	1	3	0	1
Agencies providing continuing education	4	0	6	0	1
Instructional systems used	4	1	6	2	1
Location of continuing education activities	5	1	4	2	2
Unmet continuing education needs	3	0	4	0	2
Incentive systems	2	2	1	9	0
Continuing education materials	4	0	2	2	0

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